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| 10/565,302 | 01/20/2006 | Akinori Sudoh | Q76805 | 7084 |

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| EXAMINER | |
|---|---|
| BARROW, AMANDA J | |

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| 1795 | |

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/565,302 | SUDOH ET AL. | |
| | Examiner | Art Unit | |
| | AMANDA BARROW | 1795 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *19 November 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-37* is/are pending in the application.

4a) Of the above claim(s) *11-13,15,16,18-29 and 35-37* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10,14,17 and 30-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *8/24/2009*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Status of Application*

1. The Applicant's amendment filed on 11/19/09 was received. Claim 30 was amended. Claims 11-13, 15, 16, 18-29, and 35-37 were restricted out by the Examiner and withdrawn by the Applicant.

2. The texts of those sections of Title 35, U.S.C. code not included in this action can be found in the prior Office Action issued on 8/19/2009.

### *Claim Rejections - 35 USC § 112*

3. The claim rejection under 35 U.S.C. 112, second paragraph on claim 30 is withdrawn because the claims have been amended.

### *Claim Rejections - 35 USC § 103*

4. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over Nishimura et al. (EP Patent Application 1,191,131 A1) in view of Gernov et al. (US Patent 6,194,099 B1) and Parmentier et al. (US Patent 6,361,900 B1) on claims 1, 2, 4-10, 30-33 are maintained.

Regarding claim 1, Nishimura discloses an electrode which comprises a carbonaceous material ("electrode active substance") and carbon fibers having a diameter of 1 μm or less (namely, 1000 nm) (paragraphs 2-5). Nishimura does not disclose the porosity of the electrode; however, Gernov discloses that it is known in the art that if one wants to achieve the highest possible volumetric density of the electroactive material in an electrode, that it is desirable to

maintain the porosity of air voids as low as possible (column 2, lines 60-67). Gernov also discloses that carbon nanofibers having a diameter of less than about 1000 nm should be used (column 6, lines 20-29).

Therefore, it would be obvious to a person of ordinary skill in the art to modify the electrode of Nishimura to include a low porosity as taught by Gernov as this produces the known result of achieving the highest possible volumetric density of the electroactive material in an electrode (Gernov - column 2, lines 60-67). The discovery of an optimum value of a known result effective variable, without producing any new or unexpected results, is within the ambit of a person of ordinary skill in the art. See *In re Boesch*, 205 USPQ 215 (CCPA 1980) (see MPEP § 2144.05, II.).

Furthermore regarding claim 1, Parmentier gives evidence that the specific porosity range claimed (25% or less) is known in the art as Parmentier teaches a secondary cell electrode comprising a carbon fiber substrate in which the carbon of the fibers presents the electrode with a total porosity in the range of 10% to 30% (column 1, lines 56-62). In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. In re Wertheim, 541 F.2d.257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990); *In re Geisler*, 116 F.3d 1465, 1469-71, 43 USPQ2d 1362, 1365-66 (Fed Circ. 1997). See MPEP 2144.05.

Regarding claim 2, Nishimura discloses that the carbon fibers have a high degree of crystallinity ("graphite carbon fiber") (paragraphs 18 and 25). Nishimura discloses that the carbon fibers are heated to 2000°C or higher (page 4, lines 14-15).

Regarding claim 4, Nishimura discloses that the graphite carbon fiber contains boron in the amount of 0.1-3 mass % (namely, 1,000 to 30,000 ppm) (page 4, lines 4-17). In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. *In re Wertheim*, see MPEP 2144.05.

Regarding claim 5, Nishimura disclose that the amount of carbon fiber is 20 mass % or less (paragraph 9). In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. *In re Wertheim*, see MPEP 2144.05.

Regarding claim 6, Nishimura discloses that the carbon fibers have an aspect ratio of 10 or more, and preferably 50 or more. In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. *In re Wertheim*, see MPEP 2144.05.

Regarding claim 7, Nishimura discloses that the crystalline carbon fiber ("graphite carbon fiber") has an interlayer distance $d_{002}$ between carbon layers as determined by X-ray diffraction method in a range of 0.335 to 0.342 nm (page 3, lines 57-58) which falls in the range claimed of 0.344 nm or less. In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. *In re Wertheim*, see MPEP 2144.05.

Regarding claims 8 and 9, Nishimura discloses that fine carbon fibers includes "expanded carbon fibers and other fibrous carbons," (paragraph 2) which would read on carbon fibers having a hollow structure in its interior ("expanded carbon fibers") and branched carbon fiber ("fibrous carbons") as claimed.

Additionally, Gernov discloses that the non-activated carbon fibers may exist as a variety of forms including hollow tubes or branched (column 10, lines 31-35). The simple substitution of one known element for another is likely to be obvious when predictable results are achieved. See *KSR International Co. v. Teleflex Inc.*, 550 U.S., 82 USPQ2d 1385, 1395 – 97 (2007) (see MPEP § 2143, B.). Therefore, it would be obvious to a person of ordinary skill in the art to modify the carbon fibers used in the electrode of Nishimura to include carbon fibers which have a hollow structure in the interior or are branched as disclosed by Gernov as the predictable result of improving the charge-discharge capacity and mechanical strength of the electrode plate would be yielded (Nishimura – page 2, lines 14-17).

Regarding claim 10, Nishimura discloses an electrode which comprises a carbonaceous material ("electrode active substance") that is incorporated into the electrode as electric conductivity-providing agents (paragraph 5).

Regarding claim 30, Nishimura discloses a carbon fiber having a diameter of 1 μm or less (namely, 1000 nm) (paragraphs 2-5) in an amount 20 mass % or less (paragraph 9). In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. *In re Wertheim*, see MPEP 2144.05.

Furthermore regarding claim 30, if one of ordinary skill in the art were to modify the electrode of Nishimura to have a low porosity as taught by Gernov (see the rejection of claim 1), it is the position of the examiner that the properties of the electrode, including the capacity density and the high electrolytic solution permeability, would be inherent to the system or the system could easily be modified to have a capacity density of 100 mAh/g or higher and a high electrolytic solution permeability as claimed. The prior art can be modified or combined to

reject claims as *prima facie* obvious as long as there is a reasonable expectation of success. See *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986) (see MPEP § 2143.02). Therefore, it would be obvious to a person of ordinary skill in the art to make the aforementioned modification which would result in an electrode with a lower porosity, a high capacity density and a high electrolytic solution permeability.

Additionally, Gernov not only discloses that to achieve the highest possible volumetric density of the electroactive material in an electrode that it is desirable to maintain the porosity of air voids as low as possible (column 2, lines 60-67), but also carbon nanofibers having a diameter of less than about 1000 nm (column 6, lines 20-29) and an electroactive sulfur-containing cathode material ("electrode active material"). It is the position of the examiner that as all of the constituents of the electrode are recited by Gernov (i.e. - electrode active substance, carbon fibers, diameter of carbon fibers, and porosity), the capacity density and high electrolytic solution permeability would be inherent. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. Inherency is not established by probabilities or possibilities. *In re Robertson*, 49 USPQ2d 1949 (1999). Applicant is advised to submit other information with respect to Gernov's electrode if it is shown to be patentably distinct from the instant invention as the Courts have held that it is well settled that where there is a reason to believe that a functional characteristic would be inherent in the prior art, the burden of proof then shifts to the applicant to provide objective evidence to the contrary. See *In re Schreiber*, 128 F.3d at 1478, 44 USPQ2d at 1478, 44 USPQ2d at 1432 (Fed. Cir. 1997) (see MPEP § 2112.01, I.). Please see the motivation for incorporating aspects of Gernov into the electrode of Nishimura in the rejection of claim 1.

Regarding claim 31, Nishimura does not disclose if the electrode absorbs 3 μL of propylene carbonate within 500 seconds at 25°C and 1 atm; however the arguments in the previous two paragraphs hold true for this limitation as well. If one of ordinary skill in the art were to modify the electrode of Nishimura to have a low porosity as taught by Gernov (see the rejection of claim 1), it is the position of the examiner that the properties of the electrode including the absorption rate of propylene carbonate could easily be attained. The prior art can be modified or combined to reject claims as *prima facie* obvious as long as there is a reasonable expectation of success. See *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986) (see MPEP § 2143.02). Therefore, it would be obvious to a person of ordinary skill in the art to make the aforementioned modification which would result in an electrode with the claimed absorption rate.

Additionally, Gernov not only discloses that to achieve the highest possible volumetric density of the electroactive material in an electrode that it is desirable to maintain the porosity of air voids as low as possible (column 2, lines 60-67), but also carbon nanofibers having a diameter of less than about 1000 nm (column 6, lines 20-29) and an electroactive sulfur-containing cathode material ("electrode active material"). It is the position of the examiner that as all of the constituents of the electrode are recited by Gernov (i.e. - electrode active substance, carbon fibers, diameter of carbon fibers, and porosity), the capacity absorption of propylene carbonate within 500 seconds at standard temperature and pressure would be inherent. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. Inherency is not established by probabilities or possibilities. *In re Robertson*, 49 USPQ2d 1949 (1999).

Applicant is advised to submit other information with respect to Gernov's electrode if it is shown to be patentably distinct from the instant invention as the Courts have held that it is well settled that where there is a reason to believe that a functional characteristic would be inherent in the prior art, the burden of proof then shifts to the applicant to provide objective evidence to the contrary. See *In re Schreiber*, 128 F.3d at 1478, 44 USPQ2d at 1478, 44 USPQ2d at 1432 (Fed. Cir. 1997) (see MPEP § 2112.01, I.). Please see the motivation for incorporating aspects of Gernov into the electrode of Nishimura in the rejection of claim 1.

Regarding claim 32, Nishimura discloses that the invention relates to an electrode for batteries (paragraph 2).

Regarding claim 33, Nishimura discloses that the invention relates to an electrode for batteries for any of a variety of batteries including a Li ion secondary battery (paragraph 2).

6. The rejection under 35 U.S.C. 103(a) as being unpatentable over Nishimura, Gernov and Parmentier as applied to claims 1, 2, 4-10, 30-33 above, and further in view of Ouvry (US Patent 6,444,347 B1) on claim 3 is maintained.

Regarding claim 3, Nishimura does not disclose that the graphite carbon fiber undergoes an oxidation treatment which introduces an oxygen-containing functional group onto the surface; however, Ouvry demonstrates that this technique is well known in the art. Ouvry teaches that a controlled oxidation treatment of the activated carbon cloth (constituted of carbon fibers) is performed prior to depositing the catalyst so as to increase the concentration of the function groups (namely, oxygen-containing functional groups) constituting the surface chemistry of the activated carbon cloth to ensure the catalyst is well dispersed (column 3, lines 21-25 and column

5, lines 51-55). Ouvry also discloses that the carbon cloth constituted of carbon fibers can be a graphite cloth with graphite fibers (column 1, lines 15-24).

Therefore, it would be obvious to a person of ordinary skill in the art to apply the oxidation treatment technique of Ouvry to the electrode of Nishimura in order to make sure the catalyst (boron) is well dispersed (Ouvry, column 5, lines 51-55).

7. The rejection under 35 U.S.C. 103(a) as being unpatentable over Nishimura, Gernov and Parmentier as applied to claims 1, 2, 4-10, 30-33 above, and further in view of Qu (US Patent Application 2003/0049531 A1) and Ishikawa et al. (US Patent Application 2003/0118908) on claim 14 is maintained.

Regarding claim 14, Nishimura discloses that the carbonaceous material ("electrode active substance") can include artificial and naturally occurring graphite (paragraph 5) and that these are implemented to enhance the conductivity of the negative electrode (paragraph 8). Nishimura does not disclose the amount by mass of how much carbonaceous material ("electrode active substance") is to be used or the bulk density of the electrode; however, it is well known in the art to manipulate the amount of graphite material ("electrode active substance") of the electrode to produce desired electrode properties. For example, it is well known that including more of the electrode active substance increases the capacity of the cell. This is evidenced by Qu (paragraph 5).

Manipulating the amount of the graphite material, or any electrode active substance for that matter, would change the bulk density of the electrode. Therefore, by providing the graphite material in an amount of 50 mass% or more to the carbon fibers which is an obvious

modification, it would be inherent to the system that the electrode would have the bulk density claimed. Additionally, the bulk density range that is claimed is 1.7 $g/cm^3$ or more which is a bulk density already achieved in the art as evidenced by Ishikawa (paragraph 38).

Therefore, it would be obvious to a person of ordinary skill in the art to modify the electrode taught by Nishimura to include a specific amount of graphite material ("electrode active material") as this would yield the predictable result of increasing or decreasing the capacity of the cell (Qu – paragraph 5). The discovery of an optimum value of a known result effective variable, without producing any new or unexpected results, is within the ambit of a person of ordinary skill in the art. See *In re Boesch*, 205 USPQ 215 (CCPA 1980) (see MPEP § 2144.05, II.). Furthermore, manipulating the amount of graphite material would also result in different bulk densities and as evidenced by Ishikawa, the bulk density range claimed (1.7 $g/cm^3$ or more) is not novel.

8. The rejection under 35 U.S.C. 103(a) as being unpatentable over Nishimura, Gernov, Parmentier, Qu and Ishikawa as applied to claim 14 above, and further in view of Yamada et al. (US Patent 6,040,092) on claim 17 is maintained.

Regarding claim 17, the claim limitation of the carbon particles being in an amount of 50 mass% or more was addressed in the rejection of claim 14. Nishimura does not disclose the specific properties of the graphite particles to be used; however, Yamada discloses graphite particles for use in a nonaqueous secondary battery electrode. Yamada discloses that the graphite particles have an interlaying spacing d002 between (002) planes measured by X-ray diffraction in the range from 0.335 to 0.340 nm (column 3, lines 24-40). Applicant's

specification notes that a $C_0$ of a (002) plane of 0.6900 nm is equivalent to a $d_{002}$ of 0.3450 (page 21). As the thousandths place is the last significant figure in the range taught by Yamada, the latter part of the range (0.340 nm) is equivalent to the number claimed (0.3450). In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. *In re Wertheim*, see MPEP 2144.05.

Yamada also discloses that the La and the Lc are preferably not less than 10 nm because if these numbers are less than 10 nm, the crystallinty of graphite particles is not enough (column 3, lines 25-40). Further, Yamada gives examples in which the specific surface area of the graphite particles used is 5 $m^2/g$ (column 8, lines 54-67). Yamada also discloses that the laser Raman R value is not more than 0.4 (column 3, lines 24-40). All of these ranges either overlap or lie inside the ranges disclosed by the prior art and as such, a prima facie case of obviousness exists. *In re Wertheim*, see MPEP 2144.05. Additionally, it is the position of the examiner that the value of the true density would be inherent to the graphite particles taught by Yamada as the reference discloses the same structure and the same properties. A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. Inherency is not established by probabilities or possibilities. *In re Robertson*, 49 USPQ2d 1949 (1999).

Therefore, it would be obvious to a person of ordinary skill in the art to use the graphite particles used in the electrode of Yamada for the graphite particles in the electrode of Nishimura because Yamada teaches that the graphite particles used provide a battery with a high capacity and is less costly to manufacture (column 2, lines 40-44).

9. The rejection under 35 U.S.C. 103(a) as being unpatentable over Nishimura, Gernov and Parmentier as applied to claims 1, 2, 4-10, 30-33 above, and further in view of Takahashi et al. (US Patent Application 2003/0124424 A1) on claim 34 is maintained.

Regarding claim 34, Nishimura discloses that the invention relates to an electrode for batteries for any of a variety of batteries including a Li ion secondary battery (paragraph 2), but does not include the specifics of the Li ion secondary battery such as the non-aqueous electrolytic solution or polymer electrolyte to be used. It is well known in the art to use the solvents listed as a non-aqueous electrolytic solution as is evidenced by Takahashi. Takahashi teaches that as an electrolytic solution for a lithium ion secondary battery, a mixture of ethylene carbonate and diethyl carbonate is used (paragraph 174).

Therefore, it would be obvious to a person of ordinary skill in the art to use the electrolytic solution listed by Takahashi in the lithium ion secondary battery taught by Nishimura as this would yield the predictable result of providing a functional battery.

***Response to Arguments***

9. Applicant's arguments filed 11/11/09 have been fully considered but they are not persuasive. Furthermore, the Examiner has also rejected the independent claim twice using the art submitted in the IDS by the Applicants.

*Applicant's remaining principal arguments are*

*(a) There is no motivation to combine Nishimura with Parmentier because Nishimura teaches using carbon fibers having a high graphitization degree.*

*(b) Parmentier teaches the porosity of the carbon fibers, not that of the electrode.*

*(c) Gernov discloses the porosity range of 40 to 60% and does not teach 25% or less.*

In response to Applicant's arguments, please consider the following comments.

(a) Parmentier was used to give evidence that the specific porosity range claimed (25% or less) is known in the art. Furthermore, Gernov teaches an electrode with nanofibers having a diameter of less than about 1000 nm should be used (column 6, lines 20-29) and that if one wants to achieve the highest possible volumetric density of the electroactive material in an electrode, that it is desirable to maintain the porosity of air voids as low as possible (column 2, lines 60-67). Thus, the porosity is a known-result effective variable easily modified by a person of ordinary skill in the art to a desired range such as that disclosed by Parmentier.

(b) The Examiner respectfully disagrees with this statement as Parmentier teaches that the electrode is presented with a total porosity lying in a range of 10 to 30% (see column 1, lines 56-62). Furthermore, the porosity of the electrode is a known-result effective variable as shown by Gernov.

(c) Gernov teaches that the porosity is a result-effective variable (if one wants to achieve the highest possible volumetric density of the electroactive material in an electrode, that it is desirable to maintain the porosity of air voids as low as possible (column 2, lines 60-67)), thus it would have been obvious to manipulate the porosity to a desired range other than what is taught by Gernov. Furthermore, Parmentier gives evidence that the range of 25% or less is known in the art.

***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a). Furthermore, the new grounds of rejection are based on Applicant's submission of an information disclosure statement under 37 CFR 1.97(c) with the fee set forth in 37 CFR 1.17(p) on 8/24/2009.

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AMANDA BARROW whose telephone number is (571)270-7867. The examiner can normally be reached on 7:30am-5pm EST. Monday-Friday, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on 571-272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/AMANDA BARROW/
Examiner, Art Unit 1795

/Dah-Wei D. Yuan/
Supervisory Patent Examiner, Art Unit 1795